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The role of ambidexterity in managing buyer-supplier relationships: The Toyota case

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Abstract

Most ambidexterity theories deal with managing exploration-exploitation tradeoffs among business units within firms or between alliance partners, but these theories remain yet to be extended to the buyer-supplier relationship level. Through an in-depth case study of the Toyota Motor Corporation we illustrate how buying firms can simultaneously achieve short-term and long-term benefits with their long-standing suppliers. Taking two inherently different activities as a starting point – mass production with its focus on exploitation and product development with its focus on exploration, we show that the deliberate use of ambiguity and explicitness can function as a countervailing mechanism against overemphasizing either exploration or exploitation. We also show that structural separation and structural integration are two organizational systems which can be used by buying firms to help suppliers realize ambidexterity in their operations. Finally, we argue that ‘requisite security’ can help to motivate suppliers to address the paradoxical tensions deliberately created by buying firms.

Introduction

Long-term buyer-supplier relationships have attracted considerable attention from organizational theorists who argue for their superior effectiveness, in light of the limitations of short-term, purely price-based relationships (Adler 2001). Studies of Japanese automotive manufacturers have shown that long-term buyer-supplier relationships contribute to competitive advantages by lowering transaction costs (Dyer and Chu 2003, Sako and Helper 1998), and fostering knowledge sharing routines (Dyer and Hatch 2006, Dyer and Nobeoka 2000). In the age of intensified competition, however, there is growing recognition that short-term price-based relationships must co-exist with long-term buyer-supplier ones, such as Japanese *keiretsu* (Ahmadjian and Lincoln 2001, Aoki and Lennerfors 2013b, MacDuffie and Helper 2006). Regardless of this, theories of the management of buyer-supplier relationships are largely framed in terms of tradeoffs (either/or), and do not fully consider the benefits of a paradoxical (both/and) perspective (e.g. Schad et al.

2016; Smith and Lewis 2011).

This paper aims to narrow the gap by leveraging the concept of ambidexterity to the analysis of buyer-supplier relationships, and by developing theoretical insights into ambidexterity in inter-organizational relationships (IOR). Ambidexterity refers to the ability to manage the tradeoff between exploration and exploitation to excel at both simultaneously (Andriopoulos and Lewis 2009, O'Reilly and Tushman 2013). Most studies have developed theories of how firms achieve ambidexterity within the organization, but few have focused on ambidexterity at the IOR level (Birkinshaw and Gupta 2013, Im and Rai 2008). Those that do have mainly discussed performance implications from alliance portfolios, and suggest that firms can more easily balance exploration and exploitation by using alliances for different purposes, e.g. alliances with R&D-oriented partners for exploration, and alliances with commercialization-oriented partners for exploitation (Kauppila 2010, Lavie et al. 2011, Rothaermel 2001, Rothaermel and Deeds 2004). Still, little is known about how organizations manage the exploration-exploitation tradeoff in a long-term relationship with the same partner that has both exploratory and exploitative domains. We ask through which distinctive mechanisms buyers can encourage and enable their long-standing suppliers to excel at both exploration and exploitation, and simultaneously achieve short-term and long-term benefits from the relationship.

In order to address this question, we collected in-depth data on Toyota and its supplier relationships. Toyota provides a valuable empirical context as it systematically embeds paradoxical thinking in its strategies and practices (Osono et al. 2008, Spare and Bowen 1999), and simultaneously achieves higher customer value, e.g. higher product quality (Fujimoto 1999) and higher operational efficiency, e.g. lower Work in Progress/Sales Ratio (Lieberman and Dhawan 2005) than competitors. Toyota, thus, occupies what Porter (1996) termed the productivity frontier position which represents sustained competitive advantage in a given industry. Given limited firm resources, it is inherently difficult to achieve simultaneously high customer value (by exploration) and high operational efficiency (by exploitation) (March 1991). Past studies have suggested that Toyota is better able to manage this tradeoff with suppliers because of long-standing, trustful relationships with them (e.g. Fujimoto 1999, Liker 2004). At the same time, Toyota's *keiretsu* has successfully responded to the need to move towards more market-oriented relationships (Aoki and

Lennerfors 2013a, 2013b), as exemplified by the launch of the CCC21 (Construction of Cost Competitiveness for the 21st Century) program in 2000 (MacDuffie and Helper 2006). Under CCC21, Toyota demanded an unprecedented 30% cost reduction in three years from long-standing suppliers with excellent development capabilities (FOURIN 2000). This raises questions about how suppliers were motivated to make such steep cuts and still continue to make long-term investment in developing products for Toyota. Our study aims to shed more light on Toyota's ambidextrous management of long-standing supplier relationships and how it ensures its sustained position at the productivity frontier.

Over a period of fourteen years (2003-2016) we conducted more than 170 interviews at Toyota headquarters and at its domestic and overseas plants, and also at Toyota's long-standing suppliers. Our findings reveal distinct mechanisms through which suppliers can countervail overemphasis on either exploration or exploitation. They include a deliberate mix of ambiguity and explicitness in goal formulation and implementation, and also organizational systems that help suppliers achieve ambidextrous results through both the structural separation and the integration of internal functions. The mechanisms are used differently for mass production than for product development. We also identified the role of 'requisite security' in reducing excessive pressure on suppliers from buyer paradoxical demands, and in encouraging suppliers' management teams to address challenges posed by these demands at both the mass production and the product development phases. We explore a model of ambidexterity in buyer-supplier relationships, provide several observations that take into account boundary conditions, and develop a context-sensitive theory of ambidexterity at the IOR level.

Theoretical background

Ambidexterity in and across organizations

Past ambidexterity studies have identified several ways of managing the tradeoff between exploration and exploitation (O'Reilly and Tushman 2013). Structural ambidexterity is a method for simultaneously pursuing exploration and exploitation by physically separating organizational subunits, for instance R&D units pursuing innovation and production units striving for efficiency (Adler and Heckscher 2013, Benner

and Tushman 2003). According to Puranam et al. (2006), two structural archetypes separately support inter-organizational knowledge acquisition in different phases of technological development: one being structural separation with different units retaining their autonomy and exercising their own capabilities, which is particularly useful for exploration during technological development; the other being structural integration with different well-coordinated units exercising their integrated capabilities, which plays a central role in exploitation in the commercialization of developed technologies.

An important challenge for senior management teams aiming for structural ambidexterity is handling contradictions between differentiated subunits while at the same time ensuring integration across them (Jansen et al. 2009, Smith and Tushman 2005). At the IOR level, subunits, or suppliers, are only loosely coupled, each having their own culture, incentives, and distinct managerial team, which makes it easier to achieve structural ambidexterity (Benner and Tushman 2003, Lavie and Rosenkopf 2006). For example, Dyer et al. (1998) describe the close relationships Toyota and Nissan have with affiliated suppliers whom they encourage to pursue innovation, while with non-affiliated, standardized part suppliers they achieve cost efficiency. When encouraging the same suppliers to pursue exploration and exploitation simultaneously, however, buying firms need to be careful about the demands they impose on suppliers' management teams: If the buying R&D units ask for innovative product development while their production units demand simultaneously cost efficiency, suppliers may find it difficult to manage resultant contradictions.

Firms can oscillate between exploration and exploitation over time, temporally and sequentially alternating between organizational structures to bolster exploration or exploitation (Boumgarden et al. 2012, Nickerson and Zenger 2002). For example, Toyota strategically shrinks work-in-progress inventory to shift from routinized activities to exploratory learning both at operational and supply chain level (Adler et al. 2009, Brunner et al. 2009). Such forms of sequential ambidexterity stimulate sudden or gradual shifts (Lavie and Rosenkopf 2006, Romanelli and Tushman 1994), and require proactive management interventions to manage transitions between exploration and exploitation (Lavie et al. 2010). In buyer-supplier relationships, however, buying firms are not able to directly manage transitions, and need to be careful of the challenges they impose on suppliers' management teams.

Finally, defining an organizational context that combines discipline, stretch, trust and support appropriately can encourage “individuals to make their own judgments as to how to best divide their time between the conflicting demands for alignment and adaptability”, and help organizations to achieve ambidexterity (Gibson and Birkinshaw 2004, p. 211). Adler et al. (1999) describe how Toyota management practices, such as assigning workers the responsibility to conduct *kaizen* (continuous improvement), encourage workers to not only follow standardized operating procedures, but also to improve them. Although contextual ambidexterity studies mainly focus on individual and group level behaviors in an organization (Lavie et al. 2010), some researchers discuss how contextual ambidexterity supports inter-firm knowledge and learning processes (e.g. Im and Rai 2008, Zimmermann et al. 2015). For example, Zimmermann et al. (2015) describe a bottom-up process through which an exploratory or exploitative alliance evolves into an ambidextrous one. Yet past research provides little insight into how firms can manage the ambidexterity of long-standing partners with both exploration and exploitation domains to achieve mutual short- and long-term benefits with them.

The three modes described above use different mechanisms to manage the exploration-exploitation tradeoff, and each entails different management challenges. However, they are not in conflict, but rather are complementary (Andriopoulos and Lewis 2009, Raisch et al. 2009). For instance, Adler et al. (1999) describe how Toyota creates contextual ambidexterity internally through parallel organizational structures, with workers engaging in routinized activities in day-to-day operations, while switching to non-routinized *kaizen* activities in quality circles (i.e. structural ambidexterity). However, the distinctive mechanisms through which suppliers are encouraged to pursue both exploration and exploitation in long-term buyer-supplier relationships remain opaque. Although as Adler et al. (1999) suggest, quality circles and job enrichment encourage employees within organizations to address the exploration-exploitation tradeoff in an active manner, the same mechanism is not applicable in buyer-supplier relationships as suppliers have their own management teams and make autonomous decisions. This underlines the importance of considering different organizational settings and different levels of analysis, and of taking a stronger context-sensitive approach to ambidexterity (Gupta et al. 2006, Lavie et al. 2010).

Exploration and exploitation in buyer-supplier relationships

Buyer-supplier relationships are a form of IOR, or a quasi-integrated structure between markets and hierarchies (Im and Rai 2008). They resemble hierarchical structures with pronounced power asymmetries between partners as suppliers must meet the demands of buyers. At the same time, suppliers have their own decision making authority, and thus cannot be managed through hierarchical fiat. Instead, buying firms attempt to control suppliers through contractual relationships (Williamson 1979) that range from arm's-length to obligational (Sako, 1992). While the former seek to control supplier performance by contractually specifying their responsibilities, the latter maintain supplier autonomy while prompting voluntary efforts to improve performance through the establishment of trustful buyer-supplier relationships (Dyer and Chu 2003; Sako and Helper 1998).

Autonomy and control in buyer-supplier relationships are strongly connected to the management of the exploration-exploitation tradeoff. Exploration can be encouraged by an increase in actor autonomy, such as through job enrichment, and result in new routines (Adler et al. 1999), although inevitably autonomy sacrifices to some degree the coordinated or disciplined efforts among actors needed for achieving efficient use of resources (March 1991, Puranam et al. 2006). Exploitation in contrast is achieved through the efficient use of existing organizational resources through routinization (Adler et al. 1999, Lavie et al. 2010). The routinization of operational procedures increases the controllability of organizational behavior (Cohen et al. 1996), but reduces opportunities for new experiences (March 1991). Thus, to achieve ambidexterity in long-term relationships with suppliers, buying firms need to address the underlying tradeoff between autonomy and control.

Even when buying firms are able to encourage suppliers to pursue both exploration and exploitation, they must reckon with the fact that suppliers have organizational routines and capabilities for achieving ambidexterity that differ from their own. Merely granting autonomy to a supplier does not necessarily lead to enhancing exploratory behavior at the operational level. Likewise, keeping tight control over a supplier may squeeze its profit margins and so imperils its trust in the relationship. If a buying firm wants a supplier

to excel at both exploration and exploitation, it needs to mobilize its internal organizational functions, and put in place systems that guarantee the supplier can do so without negatively impacting its own profits. Toyota for example has organizational systems to support suppliers in exploratory activities such as developing new system components (Aoki and Lennerfors 2013a), and others to support exploitative activities which can lead to improving productivity, quality, and inventory turnover (e.g. Dyer and Nobeoka 2000, Sako 2004). Since suppliers have limited resources, a strong emphasis on the part of the buying firm on exploration or exploitation is likely to result in the supplier focusing exclusively on one or the other. The mechanisms a buying firm can use to countervail that are the subject of our systematic analysis of ambidexterity in Toyota's supplier relationships.

Research Methods

Given the explorative nature of our research, we relied on an inductive case study design (Eisenhardt and Graebner 2007). We used a single case study (Yin 2003) and selected Toyota as a successful example. Empirical evidence points to Toyota's ability to achieve both short and long term benefits from its supplier relationships. Its CCC21 program launched in 2000 to introduce more market-based elements into its purchasing policy did not aim to increase profitability by merely squeezing suppliers. Table 1 shows that the average profit ratios of Toyota and its major suppliers over the 2003-14 period was higher than that of its Japanese and Western rivals. These higher profit ratios reflect the short-term benefits achieved in supplier relationships, while long-term sales growth can be regarded as an indicator of long-term benefits.

Table 1 about here

Data collection

Our data collection began in 2003 when the first results of the CCC21 program became known. It was clear with the first interviews in 2003 at Toyota's Japanese headquarters that its purchasing was globalized and its supplier management highly interlinked with other functions such as JIT (just-in-time) production, design

sourcing, and shop-floor continuous improvement (*gemba kaizen*). Between 2003 and 2016 we conducted 38 interviews with representatives of various Toyota divisions in and outside of Japan (see Table 2).

Table 2 about here

In the same period we collected data from among Toyota's first-tier suppliers. Our focus on Toyota management practices vis-à-vis long-standing suppliers led us to select for interview suppliers meeting the following criteria: 1) having Toyota as the biggest customer; 2) having done business with Toyota for at least 30 years as a member of its supplier association; and 3) having both production and R&D internal subunits facing competitive pressures and uncertain environments. We conducted 136 interviews with 12 suppliers in different locations as shown in Table 2.

These semi-structured interviews were based on different sets of questions depending on the informant's function. For example, we asked Toyota informants in charge of supplier process improvement about joint problem-solving activities, participant motivation, and the performance measurements used. Each interview lasted between thirty minutes and two and a half hours, and all of them were tape-recorded and fully transcribed. We asked similar questions on the same topics in the interviews with Toyota and with a number of suppliers in different regions in order to validate the data and increase its trustworthiness (Lincoln and Guba 1985).

During the same period we also conducted 13 plant tours at Toyota's four assembly plants in Japan, Motomachi (6 times), Takaoka, Tsutsumi, and Kyushu, and four overseas plants, Bangalore in India, Burnaston in the UK, Tenjin in China, and Valenciennes in France. This allowed us to collect additional information on Toyota's ambidextrous practices, such as *gemba kaizen*. We looked at supplier ambidextrous behavior by collecting information on their *gemba kaizen* with visits to 33 plants. Further data was collected from archival documents, including reports from Japanese research institutes such as FOURIN, Japanese newspapers such as "Nihon Keizai Shimbun", and Toyota company documents (e.g. Annual Report for each year from 2003 to 2015, and the 75 Years of TOYOTA: http://www.toyota-global.com/company/history_of_toyota/75years/). We triangulated data from various sources (i.e.

interviews, observations and archival documents) to address retrospective bias.

Data analysis

We analyzed the data in three steps while iterating between literature and the empirical data. First we identified two analytical units of Toyota supplier management: (1) mass-production (MP) where both buying firms and suppliers mainly conduct routinized activities for exploitative purposes; (2) product development (PD) where non-routinized exploratory activities play a central role both for buying firms and suppliers. We extracted systems, practices and events related to Toyota's PD separately from its MP to get a more complete picture of both activities, and did the same for its suppliers.

Second, within each of the two analytical units we attempted to identify how Toyota enabled suppliers to manage the exploration-exploitation tradeoff using the following coding process: We first classified the data into two broad categories, buying firm supplier management practices that address the control-autonomy tradeoff, and buying firm organizational systems that help suppliers achieve ambidexterity. Within each of the two categories we conducted first-order coding using interviewees' own terms as *in vivo* codes, which were subsequently linked to abstract themes using theoretical terms. We identified theoretical themes from the ambidexterity and the supplier relations literatures, while remaining open to any emerging phenomenon. In the course of our analysis, a new category, 'requisite security', emerged, which covered both the MP and the PD phase. These coding results are shown in Table 3-1 and 3-2 with representative quotes, while key themes used in the main text are highlighted in *italics*.

One of the difficulties we encountered in this process was the interpretation and translation of our interview data. Most interviews with Japanese informants were conducted in Japanese. The Japanese often use ambiguous words on the assumption that the parties in the conversation share a certain amount of tacit knowledge (Nonaka and Takeuchi 1995). In quotes used in this paper we complement often unspoken, implicit information by adding comments in brackets. Initial interpretations and translations were done by the first author who is a native Japanese speaker and subsequently verified by the second author who was raised in Europe, but has extensive experience with the Japanese language and culture through living and

working in Japan. Differences in interpretation were settled by sending e-mails to the original interviewees, or by additional interviews. A native speaker of English checked the accuracy of English translations.

Third, we searched for patterns across the two analytical units to create generalizable observations on ambidexterity at the buyer-supplier relationship level, by taking into consideration the different settings and boundary conditions between the two polar phases. We compared the results of the two analytical units based on our two dimensions, supplier management practices and organizational systems, as well as ‘requisite security’ as a newly emerged category. We identified theoretical relationships between the emerging constructs, and generated several observations. We confirmed our final interpretations with three extensive interviews with a well-experienced Toyota informant.

Table 3-1, 3-2 about here

Findings

Managing ambidexterity in the mass-production (MP) phase

Supplier management practices. In the MP phase both Toyota and its suppliers mainly conduct routinized activities related to automobile production. Toyota issues *kanban* to suppliers several times per shift to keep them updated on quantities needed and delivery timing. The suppliers use the information to produce parts and deliver them in a JIT manner. A critical issue in supplier management in this phase is keeping routinized production activities at a steady state. Towards that end, Toyota formulates *explicit goals*, such as ppm (defective parts per million), and on-time delivery rates. Toyota monitors goal achievement and regularly provides performance feedback. If suppliers only stuck to their routinized activities, however, it would be difficult to motivate them to improve their existing routines. Therefore, Toyota prescribes *gentei* (cost reduction) targets, that usually range from 1 to 1.5%, to all major suppliers either annually or semi-annually to get them to break out of existing routines and create new ones. A corporate planning manager of Supplier 10 explained *gentei* as follows:

“Toyota gives us cost reduction targets in the form of x% from the current price. We are engaged in achieving this target through our own *kaizen* activities. Once the price is revised, we are given a lower price target in the

next round. Then we need to work on further lowering prices. It is very tough to address *gentei*.”

Suppliers need to meet *gentei* requests without lowering the exacting requirements of quality or deliver accuracy. An executive director of Supplier 3 noted:

“The JIT system pushes ourselves to do even more... Even a minor problem can give customers a hard time. We cannot risk worsening our quality and productivity. Under this ever-increasing pressure, we can’t live without continuously solving problems every day. We always need to do *kaizen*”

Toyota’s explicit goals are the stimulus for continuously conducting *kaizen* activities to meet cost reduction targets. At the same time, these goals, and *gentei* requests in particular, bear the risks of directing suppliers’ efforts to the attainment of cost reduction targets, through which their *kaizen* activities can easily become mere exploitative, short-term profit-seeking activities. To counter that Toyota provides several programs on how to implement *kaizen* activities, including supplier learning groups for TPS (Toyota Production System), QC (Quality Control) initiatives for problem solving activities, and other educational programs. The programs are never attempts to force suppliers to merely follow instructions, but leave *ambiguity* and leave it to suppliers to decide which elements and practices to implement. This way Toyota creates opportunities for suppliers to identify their own action points and develop their own capabilities from a long-term viewpoint.

Toyota India, for example, established a Supplier Support Center where topics such as safety, quality, and TPS are covered in a one-year extensive education program. After each module trainees return to their own plants to implement what they have learned. Toyota allows suppliers considerable latitude on implementation, encouraging them to identify their particular problems and their root causes and to improve their routines as needed. Indeed, the head of the center stressed the importance of suppliers “identifying their own problems by themselves” and “implementing what they want”. Further opportunities for raising awareness of performance differentials within Toyota suppliers are created through workshops for executives from supplier firms. The head of the center went on to say:

“We invite top executives from other suppliers to the workshop conducted in the plant of one of our best suppliers. This way, they can understand that their plant performs at a lower level. Then, they have a talk with Toyota colleagues and come to understand which areas need to be improved.”

Mutual learning opportunities are also created through learning groups (*jishuken*) that are usually made

up of 7 or 8 suppliers. Participants visit in rotation each other's plant taking part in two to three month *kaizen* projects under the tutelage of a Toyota TPS expert. The following quote from a corporate planning director of Supplier 1 shows suppliers use these opportunities for exploratory learning, not only to learn how to implement *kaizen*:

“The greatest incentive for us to join *jishuken* is to develop our human resources. If they [the employees] would only stay inside this company, their horizon would inevitably narrow. *Jishuken* is a good opportunity for them to learn from other supplier companies. We can never be content with our current situation.”

Toyota's QC program also fosters exploratory learning. A Toyota QC expert stressed the importance of teaching “a way of thinking”, and of encouraging suppliers to “ask themselves why the problem has happened”, instead of giving detailed instructions on how to solve problems. This way, suppliers can develop their own ideas on how their production processes could be improved. The same informant explained: “We cannot evolve ourselves by simply getting know-how from someone else... But we can do a big *kaizen*, or innovation, when we have ‘know-why’ [knowing the reasons behind the problem]”. The example of the British plant of Supplier 6' that participated in Toyota's QC initiative shows how the exploration-oriented perspective was retained in the implementation of *kaizen* activities. The plant not only learnt how to conduct problem solving activities through this initiative (e.g. by observing other plants' excellent practices), but also set up its own *kaizen* team with three engineers as core members. While the team was in charge of actual *kaizen* implementation in this plant, its main purpose was, however, not just geared towards cost reductions or productivity improvements. The team was charged with *kaizen* implementation at the plant, but its primary purpose went beyond cost reductions and productivity improvements as the head of the plant explained: “We encourage shop-floor supervisors and team leaders to conduct *kaizen* with the *kaizen* team, such as doing time studies. Ultimately, this activity aims at developing their ability to identify problems by themselves”.

Organizational systems. Although the purchasing division is the primary point of contact for suppliers, most of the activities that help suppliers improve their routines or achieve *kaizen* results at the operational level are conducted by other divisions, such as production, production technology and quality. While tight coordination among different divisions in Toyota's internal organization allows for quick responses to

supplier problems, interaction with suppliers is *structurally separated*. For example, while *gentei* targets are the responsibility of purchasing, it is that of the quality division to assure the quality of purchased parts. A quality division informant explained:

“I believe a supplier who lowers prices by 1% every year and who is just strictly following Toyota’s requests will sooner or later cause problems, unless the cost structure of that company is fundamentally revised. Otherwise chances are high that the company just omitted a step in the inspection process, or simplified the production process.”

This quote highlights that prescribing *gentei* targets alone is not always conducive to suppliers’ ‘real’ efforts for improving their existing routines at the operational level. Thus, Toyota’s quality division demands that suppliers create new problem-solving routines such as inventing new tools or *pokayoke* (error proofing devices) that ensure sufficient quality before a step in the inspection process can be omitted. In fact, it is the quality division with its different expertise and role, and not purchasing, that evaluates and approves changes in supplier processes. This structurally separated approach plays a critical role in helping suppliers achieve *kaizen* results without excessively focusing on short-term results, and to so manage exploration and exploitation. With the exception of Value Engineering and other activities related to PD, Toyota’s various supplier support programs do not directly aim to reduce costs to meet *gentei* targets, but try to develop supplier long-term manufacturing capabilities. For example, Supplier 12 received help that resulted in drastically improving its production process in conjunction with Toyota’s production technology engineers. The president of Supplier 12 explained:

“This project is not organized by the purchasing division for lowering the part price. It is not linked to regular cost reduction targets. Nonetheless, we aim to improve our cost competitiveness. This project has a bigger goal than merely meeting *gentei* targets in the short term. We carry out this *monozukuri* [manufacturing] revolution project for the purpose of enhancing the competitiveness of our company as a whole.”

Suppliers can also improve their existing routines by participating in Toyota’s *jishuken* and QC initiatives, which are structurally separated from *gentei* in order to foster exploration. This is illustrated by Supplier 4’s QC circle initiative at its British plant that started as part of Toyota’s QC initiative. After learning how to organize a QC circle, including steps and methods for problem solving, the plant started its own activities. The first author participated in an internal QC workshop at Supplier 4 and observed similar QC steps as ones used at Toyota: after the problem was systematically defined, root causes were identified.

Subsequent problem-solving activities led to the invention of a *pokayoke* that could eliminate eight minutes of redundant time (field notes on Supplier 4). These activities, including brainstorming and process-flow analysis, were carried out by Supplier 4's shop-floor operators and a team leader. Before the initiative, only engineers were engaged in such analytical problem-solving processes. Engineers now carry out a more supportive role helping shop-floor workers in solving problems. This led to better communication channels and to an improved understanding by engineers of shop-floor problems, and ultimately to new problem-solving routines based on stronger collaboration between the two groups.

Managing ambidexterity in the product development (PD) phase

Supplier management practices. The PD phase is characterized by greater uncertainty and the need for quick responses to unexpected problems. Suppliers must therefore have a high degree of autonomy so that they can develop adequate technical solutions for problems. Most of the suppliers we interviewed developed parts for Toyota based on their own design drawings for parts development (*shonin-zu*), but Toyota's design drawings (*Toyota-zu*) was used as well for certain categories of parts. A corporate planning manager of Supplier 10 highlighted the value of that: "Sending our engineers to Toyota allows us to bring in our ideas into the design drawings on how this part could be produced at a lower cost". As part of this guest engineer system design engineers from suppliers stay at a Toyota development center for up to three years, and work as engineers on Toyota's payroll.

In both the case of *shonin-zu* and *Toyota-zu*, suppliers that develop parts for Toyota are, in principle, selected through a competition process (Toyota Motor Corporation 2012). In the selection process suppliers must follow explicit criteria set by Toyota, such as cost and specifications. However, if Toyota, or any buying firm, were to select a supplier based only on explicitly set criteria, there is a risk that suppliers would narrowly focus on attaining the criteria at the cost of developing better products. In order to avoid that and to encourage autonomous efforts for continuous improvement (or *kaizen*), Toyota leaves some ambiguity in setting supplier-selection criteria. This is evidenced by the following excerpt from the basic purchasing policies (Toyota Motor Corporation, 2012, p. 4):

“We evaluate the overall strengths of prospective suppliers, including their quality, technological capabilities, and reliability in delivering the required quantities on time. (--line break--) Also, we evaluate their potential strengths, as evidenced in such ways as their amenability to continuing, *kaizen* improvements.”

A Toyota’s purchasing director further explained: “We take into account not only QCD [quality cost delivery] performance, but also top management attitude and company structure when we select our suppliers”. By using unmeasurable, ambiguous criteria such as “management attitude”, Toyota considers suppliers’ autonomous efforts that cannot clearly be measured in the selection process. The following quote from a corporate planning director of Supplier 1 suggests that this ambiguity encourages suppliers to go the extra mile:

“[An American maker] gives us 20 sheets of design drawings and asks us to develop a part just following the drawings. But Toyota gives us only 3 sheets. This is *shoninzu*. Our company creates a dozen detailed drawings that will be approved by Toyota. However, it is impossible to write down all of the knowhow needed in the drawings. We provide the best products to Toyota beyond what is written down in the drawings and contract terms. I think our tacit efforts might be greater than those explicitly described in the drawings.”

As a result of this *ambiguous goal setting*, instead of just meeting performance targets, suppliers continuously pursue the development of better products for Toyota. For example, a supplier of car seats for the Lexus line described how new design ideas were tried to completely get rid of wrinkles in the seat cover even though they recognized that attempt was physically impossible:

“We understand Toyota’s idea of *omoiire-hinshitsu* [emotional quality]... We respond to quality requests even if they cannot be explained by words. For example, it is impossible to get rid of wrinkles from car seats. But we make an effort to make wrinkles less noticeable as much as possible”.

In order to coordinate autonomous, exploratory efforts, Toyota tries to influence supplier activities by visualizing each step of the PD process and specifying what suppliers need to do (i.e. *control by explicitness in the implementation process*). This is codified in the ‘Toyota Standard’ which includes information such as which evaluation test is needed at a specific point in time, what judgement criterion needs to be used for specific test equipment, and which material requirement needs to be met for each part. A Toyota’s PD informant noted: “We set a rigid schedule at the design phase. A timetable showing what we do at which point in time is decided at an initial stage, and given to suppliers. We keep tight control over each process step at the design phase”. By making the implementation process transparent, suppliers are encouraged to synchronize their own PD process with Toyota’s process for ensuring better coordination. For example,

similar to Toyota's PD process, Supplier 9 made its design engineers responsible for the production process as well, and interact with production engineers from an early stage of PD:

"Our design engineers do not finish their work after completing design drawings and mold tools. They actually go into production plants. They create design drawings by going to the *gemba* [plant floor], making a confirmation [on the manufacturability of their designed parts], and reflecting *gemba* information to the design drawings." (President, Supplier 9's European office)

In order to ensure a similar coordination process in its European office, Supplier 3 has a system in place for sending newly hired design engineers to the production floor where they work as shop-floor workers for one month.

Organizational systems. In the PD phase, Toyota's organizational systems that help suppliers achieve ambidextrous results at the operational level, e.g. developing better products at lower cost, are *integrated rather than separated*. For example, Toyota has a design review system, Design Review Based on Failure Mode (DRBFM), where members from supplier firms as well as different divisions at Toyota, such as production technology and production, jointly discuss and confirm with Toyota design engineers changes that have been made in design drawings. Toyota engineering, purchasing and production teams come together with supplier representatives in Toyota's *obeya* (big room) to jointly solve problems during the development process of new vehicles. Furthermore, Toyota receives guest engineers from suppliers in almost all main areas of auto-parts development, who jointly work with Toyota and conduct problem solving in the development process.

Such integrated organizational systems allow Toyota and its suppliers to share information and knowledge at a deep level and to help coordinate the PD process between Toyota and its suppliers. The guest engineer system we have described provides opportunities for engineers from suppliers to share their PD experience with Toyota's engineers, and allows them to better understand Toyota's PD process. A PD informant of Toyota explained:

"We undertake a role of leading guest engineers... Guest engineers who come to Toyota for the first time always attend a meeting with a Toyota *sempai* [a senior colleague who takes the role of a mentor]. By interaction with their *sempai* they get to know how Toyota engages in [the PD] and the underlying thinking process."

The same informant also explained that Toyota, in turn, was able to better understand "how Toyota can change testing conditions for suppliers so that they can develop better parts" and "what support Toyota

should give suppliers at what time”. What is learned is regularly updated in the Toyota Standard.

Toyota provides suppliers with information that directly serves in developing innovative products. This is evidenced by the following quote from an anonymous supplier:

“Our component [related to powertrains] has changed from mechanical to electronic control [that uses a drastically different computerized system than before]... But we were facing a matching problem between the mechanical and the computer systems [in the development process]. We could solve this problem because Toyota gave us the needed information for achieving the matching.”

The supplier told us his firm was allowed by Toyota to also sell the newly invented product – growing out of information on key components provided by Toyota – to other carmakers. The information shared by Toyota made it possible for the supplier to cope with a major technical shift from mechanical to electronic control and to get ahead of competitors. That supplier has become the global market leader for that product.

Our findings show that suppliers that have developed a synchronized PD system with Toyota enjoy better coordination among different functional divisions within their company, which leads to the achievement of significant results. In the following quote from a 2004 interview Supplier 3 describes how it mastered the difficult challenge of a CCC21 cost reduction of 30% by integrating its existing internal resources for seeking innovative solutions:

“We cannot achieve 30% cost reduction only by developing new manufacturing methods. In purchasing, we need to look for some cheaper plastics. If such cheaper material is not able to ensure a certain degree of strength, we should change the product design to get a thicker product... We have achieved this target for some products, and are still continuing our efforts for others... We are addressing them jointly with Toyota.”

Requisite security

Although our findings show how Toyota’s supplier management practices and organizational systems can lead to ambidexterity on the part of suppliers, our analysis still leaves some questions unanswered. How are supplier management teams motivated to pursue both exploration and exploitation at the MP phase under Toyota’s structurally separated support systems? How do suppliers retain their exploratory perspective while competing for contracts and dealing with exacting requirements at the PD phase? We identified an emerging category of *requisite security* that can be used to reassure suppliers that their efforts to meet the difficult challenges posed by Toyota will be rewarded.

In the MP phase, Toyota encourages suppliers to address simultaneously achieving cost reduction, high

quality and delivery accuracy by giving them explicit targets, *gentei* in particular. *Gentei* differs from the Western carmaker practice of contractually setting price cuts (e.g. 3% for the first year, 2.5% for the second year, and so on). Not meeting a benchmark puts the supplier in breach of contract and at risk of contract termination. Toyota does not specify the exact amount of *gentei* a priori, but rather through negotiations that are ongoing with suppliers, which allows for taking each supplier's current individual situation into account. The president of Supplier 12 explains:

“We receive *gentei* requests once every six months... When we negotiate prices [with Toyota] our financial and competitive situation is taken into account. *Gentei* prices are decided in each case depending on the situation... If we have to describe how Toyota's *gentei* differs from other [Japanese] makers', I'd say that Toyota's requests are more logical.”

Thus, *gentei* are targets, not absolutes imposed on suppliers, which would create overly excessive pressures to reduce costs. The suppliers we interviewed believed that Toyota would not terminate a contract for insufficient progress based on *gentei*, which makes them feel safe. The executive director of Supplier 1 expressed this in saying: “We are under pressure of cost reduction, but we feel secure knowing that our business will not be terminated. That's why we can make efforts [for Toyota]”. Toyota, in fact, allows suppliers to reject *gentei* for one part for which reducing the cost would be especially difficult in exchange for substantial cost reductions for other parts. Requisite security is not, however, an escape valve for relieving pressure. Toyota negotiates *gentei* targets with its suppliers based on a careful analysis of the cost structure of their parts, and grants exceptions only when deemed reasonable.

Requisite security also means that Toyota guarantees the continuity of a relationship with a supplier as long as there are continuous efforts towards meeting exacting requirements. For example, we described how at the PD phase suppliers were encouraged to develop innovative ideas for better products, while reducing costs through better coordination between functional subunits and with Toyota. Competition for contracts can be fierce and a supplier may not be awarded one despite having made substantial efforts. Non-selection represents a loss of time and energy; suppliers may hedge their bets by focusing on safe exploitative-oriented projects instead of risky explorative ones. As a check on such calculations, Toyota grants unsuccessful suppliers an improved chance on the next project. An executive director at Supplier 1's US office

commented:

“In the case of US [carmakers], if we lose this time, we need to start from zero. They just say “good luck in the next model”. They don’t expect a long-term relationship with us. By contrast, we can expect a long-term relationship with our customers in Japan. Even if we lose [out on doing business with Toyota] this time, our efforts will be positively taken into account next time.”

According to a Supplier 2 plant director, Toyota helps unsuccessful suppliers to go on to develop better, cost competitive parts for upcoming models. By offering such requisite security, Toyota encourages its suppliers to make the long-term, even risky, investments needed for developing innovative products. A corporate planning director of an anonymous supplier looked back on the beginning of a part development project for Toyota’s hybrid cars:

“We all responded to Toyota’s call. We never thought hybrid cars would become as popular as they are today. We responded to it even though we expected to lose money... we developed it with huge investments and initial loss, reminding ourselves that there would be profits in the future.”

Cross-phase analysis

Our analysis led to the development of the theoretical model shown in Figure 1 which depicts how Toyota’s supplier management practices and organizational systems aim to prevent suppliers from overemphasizing either exploration or exploitation at both the management and the operational level. The model also shows that these countervailing mechanisms function differently at the MP than at the PD phase, while requisite security helps suppliers cope with Toyota’s demands across the two phases. This enables suppliers to excel at both exploration and exploitation, and hence to achieve superior short-term (profitability) and long-term (sales growth) performance for buying firms and suppliers themselves (see Table 1).

Figure 1 about here

Toyota manages the autonomy-control tradeoff by using explicitness and ambiguity differently in the two value-creating phases. At the MP phase, characterized by inherently routinized activities, Toyota gives suppliers explicit quality, cost, and delivery goals to meet. By regularly raising the bar, (i.e., *gentei*), Toyota encourages suppliers to depart from existing routinized activities. At the same time, in order to avoid an excessive focus on exploitative, cost-reduction efforts, Toyota purposefully uses ambiguity in its

implementation process and gives suppliers the autonomy they need to create new routines. At the PD phase, which involves non-routinized activities, an overreliance on explicit goals would hurt exploration and limit the search for new ideas, or the drive to experiment with novel methods. Toyota leaves considerable ambiguity in the formulation of its goals so that suppliers are given the autonomy needed to more fully utilize their potential. At the same time, Toyota coordinates suppliers' autonomous efforts by clearly specifying the implementation process in its Toyota Standard, which serves as a countervailing mechanism against too much exploration.

Ambiguity is sometimes seen as an inhibitor of collective action and a source of ongoing tension over strategic direction (Sillince et al. 2012), making organizational integration difficult (Vaara 2003). At the same time, some researchers recognize that ambiguity can be used for achieving particular strategic purposes, such as gaining stakeholder acceptance of strategic decisions by creating room for multiple interpretations (Denis et al. 2011) or stimulating creativity (Lingo and O'Mahony 2010). These contradictory views on ambiguity grow out of its dual role in sensemaking: on the one hand, ambiguity triggers sensemaking, and leads to the exploration of new meanings by allowing for multiple interpretations, on the other hand, it makes meanings equivocal, which can lead to confusion among organizational members making coordination difficult (Maitlis and Christianson 2014, Weick 1995). In the case of Toyota, ambiguity is used deliberately in the implementation process to alleviate the shortcomings of explicit goals used at the MP phase. This leads to the following observation:

OBSERVATION 1a. Buying firms can use explicitness in goal formulation for stimulating suppliers to improve their existing activities at a phase where the core activities are routinized, such as mass production, while the exploitative focus fostered by explicitness can be countervailed through the deliberate use of ambiguity in the implementation process.

On the other hand, ambiguity is used in the goal formulation process at the PD phase to encourage exploration. In order to alleviate the shortcomings of ambiguity (e.g. coordination difficulties), however, Toyota is deliberately using explicitness in the implementation process, thereby ensuring well-coordinated efforts. Accordingly:

OBSERVATION 1b. Buying firms can use ambiguity in goal formation for encouraging suppliers' autonomous, exploratory efforts at a phase where the core activities are non-routinized, such as product

development, while the shortcomings of ambiguity can be countervailed through the deliberate use of explicitness in the implementation process.

Toyota uses the structurally separated or integrated approach differently across phases to help suppliers achieve ambidexterity. At the MP phase, Toyota's purchasing function sets demanding cost reduction (*gentei*) targets to encourage supplier exploitative efforts. By structurally separating its supplier support activities from its cost reduction procedures, Toyota fosters a long-term, exploratory perspective on these activities and encourages suppliers to develop new routines on their own. At the PD phase, in contrast, Toyota uses a structurally integrated approach for ensuring that the efforts of its various divisions which help suppliers develop parts for Toyota are well-coordinated. This leads to enhanced information and knowledge sharing between Toyota and its suppliers, which in turn helps suppliers integrate their internal resources, align their activities with those of Toyota, and effectively manage their PD process.

Puranam et al. (2006) have argued that a structurally integrated approach is effective in gaining knowledge from acquisitions and conducting exploitative activities with acquisition partners, while Kang et al. (2007) and O'Reilly and Tushman (2013) have made the same arguments for exploitation within single organizations. However, we argue that structural forms function differently at the buyer-supplier relationship level where buying firms lack hierarchical fiat over suppliers. At the MP phase, integrating buying firms' support into cost reduction processes might push suppliers into the success trap (Levinthal and March 1993). In such a situation, suppliers could achieve short-term benefits from *kaizen* activities, but lose their long-term dynamic capabilities (O'Reilly and Tushman 2008, Teece et al. 1997). This in turn would create further need for support from buying firms. By structurally separating support from an exploitative purpose, buying firms can help suppliers develop their own long-term exploratory capabilities while avoiding a vicious cycle of ever-increasing demands for support by their expanding supplier base. This leads to the following observation:

OBSERVATION 2a. At the buyer-supplier relationship level where suppliers have separate management teams and organizational routines, buying firms can better help suppliers handle exploration-exploitation tradeoffs by using a structurally separated approach at a phase where the core activities are routinized.

At the PD phase a structurally integrated approach within single organizations could ensure improved

coordination among subunits but sacrifice to some degree their autonomous, exploratory efforts. At the buyer-supplier relationship level, however, suppliers are not always allowed to develop their own products without constraints imposed by the architecture of the buying firm's final product. This is particularly true in the case of products with a more integrated product architecture like automobiles (Jacobides et al. 2016). In such a situation, it is less important to maintain "pragmatic boundaries" (Carlile 2004, Raisch et al. 2009) to protect exploratory activities from the organization's exploitative tendencies. A structurally integrated approach thus, allows suppliers to better use information and knowledge gained from buying firms for developing parts that are well-adapted to the architecture of the final product. This leads to the following observation:

OBSERVATION 2b. At the buyer-supplier relationship level where the architecture of suppliers' products is integrated into buying firms' products, buying firms can better help suppliers handle exploration-exploitation tradeoffs through the use of a structurally integrated approach at a phase where the core activities are non-routinized.

Finally, requisite security offers suppliers the necessary security to deal with the challenging demands of buying firms at the MP and PD phases. By ensuring requisite security for suppliers at the MP phase, e.g. through making *gentei* targets negotiable, Toyota protects suppliers from excessive cost reduction pressures, and, hence discourages them from taking defensive actions to protect their profit margins. Toyota also ensures requisite security for suppliers, e.g. by increasing opportunities for future business in order to provide them with sufficient incentives to undertake risky, explorative projects at the PD phase. Past studies have highlighted how Toyota uses stimulation mechanisms, such as JIT (Eisenhardt and Westcott 1988), and perturbation (Adler et al. 2009, Brunner et al. 2009), to deliberately create paradoxical tensions that encourage suppliers to achieve ambidextrous results. However, little attention has been paid to how Toyota reduces the excessive pressures that can result from these tensions.

Past studies on organizational paradoxes have highlighted that paradoxical tensions often provoke anxiety and defensive actions that result in vicious cycles (Schad et al. 2016, Smith and Lewis 2011). We found in our study that Toyota's JIT and *gentei* demands create high paradoxical tensions. Requisite security can reassure suppliers that their efforts will be rewarded, and encourage proactive actions such as continuous

improvement in production and product development activities. As Weick (1995) suggests, the expectation of favorable outcomes is needed for actors to address difficult challenges. Our study suggests that buying firms, or any organization that tries to make use of stimulation mechanisms through which paradoxical tensions are created need to be careful about motivating as well as possible demotivating effects. This leads to the final observation:

OBSERVATION 3. Buying firms can successfully motivate supplier management teams to address deliberately created paradoxical tensions by offering requisite security that their efforts to address difficult challenges will eventually be rewarded.

Discussion and conclusions

Theoretical implications

Our study illustrates how a focal organization (i.e. buying firm) can encourage ambidexterity in its partner organizations (i.e. suppliers). Whereas past research on ambidexterity management in IOR has mainly focused on how firms can achieve balance between exploratory and exploitative alliances, we have explored in this paper a novel aspect, i.e., how an organization can manage the ambidexterity of a partner organization in order to achieve ambidextrous results, that is, both short-term and long-term benefits. Our model introduced the new concepts of deliberate use of ambiguity and explicitness and of requisite security to the field of ambidexterity studies.

Our model also uses existing concepts, such as structural separation and structural integration, but specifies their boundary conditions at the level of the buyer-supplier relationship. Buying firms must cope with their product performance depending on the PD and MP capabilities of suppliers they cannot manage through hierarchical coordination. When an organization attempts to achieve ambidexterity with a partner organization in such a relationship, the way structural separation and integration work differs from that described in the extant literature (Kauppila 2010; Puranam et al. 2006, Raisch et al. 2009). The structurally integrated approach is more suitable for coordinating exploratory activities between buying firms and suppliers at the PD phase, while an exploitative perspective at the MP phase should be structurally separated from buying firm support activities. Thus our model responds to calls for a stronger context-sensitive

approach to ambidexterity “to avoid unwarranted generalization” (Lavie et al. 2010, p. 141).

We also provide critical insights with novel research that links previous work on supplier relationships with the ambidexterity field. Past studies have highlighted that buying firms can achieve both short- and long-term benefits through separately managing suppliers that have specialized domains; i.e., encouraging exploration by specialized parts suppliers with excellent R&D capability as opposed to exploitation by standardized parts suppliers (Asanuma 1989, Dyer et al. 1998, Williamson 1991). Such a system fits well with the idea of structural ambidexterity (Benner and Tushman 2003, O’Reilly and Tushman 2013), but while effective for buying firms with a diversified supplier portfolio, it is less suitable for achieving ambidexterity in a relationship with a single supplier who has both specialized and standardized domains. Our study highlights the importance of countervailing mechanisms (*Observation 1a, 1b and 2a, 2b*) through which buying firms might be able to keep suppliers from excessively focusing on either exploitation or exploration, while at the same time encourage them to achieve both short-term and long-term mutual benefits. By presenting such mechanisms, our study brings supplier relationship management a step closer to a true buyer-supplier win-win.

As for the generalizability of our model, the organizational system that supports supplier’ ambidexterity at the MP phase (*Observation 2a*) is broadly applicable to the management of suppliers with production activities. A purely short-term, exploitative focus would be particularly problematic for exploitation-oriented suppliers, given shorter product life cycles and faster technological change (Schreyögg and Sydow 2010). Thus, an exploratory, long-term perspective is critical even for exploitation-oriented suppliers in order to keep up with environmental changes by continuously conducting process innovation (Abernathy 1978, Benner and Tushman 2003). A structurally separated approach that decouples exploitation from support activities has thus a positive effect on the ambidexterity of suppliers. However, our model in the PD phase is more restricted in its generalizability potential. Although the system described in *Observation 2b* can be applicable to any supplier whose components are integrated into the architecture of the final product (Jacobides et al. 2016), the same mechanism would have negative effects when developing radical innovations with new suppliers. To fully tap into the expertise of such new suppliers, buying firms need to

grant them a sufficient degree of autonomy by using structurally separated organizational systems (Benner and Tushman 2015). Thus, our model of ambidexterity fits better with incremental innovation (Abernathy 1978).

Finally, our study highlights the role of requisite security in encouraging suppliers to address paradoxical tensions and to avoid defensive actions that fuel vicious cycles (Smith and Lewis 2011). Past studies have stressed the importance of ‘paradoxical thinking’ that guides actors to accommodate paradoxical tensions, and take proactive actions that trigger organizational innovation and superior performance (Eisenhardt and Westcott 1988, Schad et al. 2016). While previous authors have described how Toyota’s culture makes employees more prone to accept contradictions (Osono et al. 2008) and willing to see problems as opportunities (Adler et al. 2009), our concept of requisite security shows how Toyota stimulates paradoxical thinking by suppliers while buffering them against excessive tensions. Requisite security thus can be regarded as an enabler of paradoxical thinking that improves ambidexterity in IOR, and connects the paradoxical perspective to ambidexterity studies in a novel way.

Practical implications

Beyond its theoretical contributions, our study has critical implications for practitioners, particularly those trying to learn ‘best practices’ (Benner and Tushman 2015) from Toyota. Past studies on Toyota have argued for the concept of ‘explicitness’ as a driver of continuous improvement (*kaizen*), achieved through visual control (Liker 2004), documented procedures (Hino 2006), and a conversion from tacit to explicit knowledge (Osono et al. 2008). Little attention has been paid to the role of ambiguity. If managers depend only on explicitness during both the goal formulation and implementation process, little room remains for employees and suppliers to exercise autonomy. As our study shows, actors can develop their own problem-solving routines by identifying problems and themselves pursuing underlying reasons. Managers and practitioners thus need to use both explicitness and ambiguity when they promote *kaizen* initiatives on the shop-floor, either at the organizational or inter-organizational level.

Our study also cautions managers who heavily rely on stimulation mechanisms. Exerting undue

pressure to achieve the cheapest price or zero inventory, elicits defensive responses that fuel vicious cycles (Smith and Lewis 2011). Requisite security is needed to encourage actors to address paradoxical tensions, and for stimulation mechanisms to be sustainable. Stimulation mechanisms without requisite security can undermine trustful relationships. This is particularly true for Western companies that actively push suppliers to lower costs, but have hard-nosed, transaction-based relationships with them, or collaboration without trust as MacDuffie and Helper (2006) put it. Our study shows how Toyota carefully manages its long-term relationships with suppliers, imposing on them exacting requirements such as *gentei* on the one hand, while allowing suppliers some leeway in setting *gentei* targets on the other, thereby avoiding excessive pressure on suppliers that could damage confidence in Toyota.

Moreover, methods for using requisite security depend on the relational context in both cultural and historical terms, and managers must be aware of that. In Japan, Toyota and its suppliers have formed close relationships over long periods of time, and supplier expectations of future rewards do not depend on contracts. The *keiretsu* relationship is regarded as a legitimized institutional system in Japan (Ahmadjian, 2016), something not easily understood in some countries. This may be behind Toyota's recall problems in the US in 2009, which can serve as a cautionary tale for managers. Unlike in the US where there is heavy reliance on contractual relationships, in Japan detailed contracts play little part in supplier management. Toyota had a short history with the throttle-pedal supplier now recognized as the source of one of the recall problems (Liker, 2010). It is possible that Toyota implicitly expected that supplier to make autonomous efforts to ensure reliable quality without sufficiently clarifying its requirements, whereas the supplier, used to receiving explicit instructions, did no more than what was clearly instructed.

Similar misunderstandings could occur, even in Japan, with independent suppliers whose main customer is not Toyota, and who may not have a strong commitment to Toyota practices. This might be the case with the airbag supplier Takata who caused another big recall problem. Ever-increasing technological complexity of automobiles (MacDuffie and Fujimoto, 2010), makes it less and less feasible to monitor all of the technical details of components and to specify every detail in a contract (Williamson, 1979). Carmakers, whether in Japan or in the US, need to depend on supplier goodwill trust (Sako, 1992) to some

degree. Toyota's recall problems point to the importance of adequate, relationship-specific supporting systems in reducing misunderstandings that might be caused by reliance on goodwill trust, e.g. relying more on clearly documented technological and inspection procedures before giving suppliers large degrees of autonomy.

Future challenges

The model that we developed here is well-suited to incremental innovation (Abernathy 1978) in industries with integral product architectures (Jacobides et al. 2016). While this makes the boundary conditions of the model clear, comparing our findings with those of studies from different industry settings (e.g. radical innovation and/or modular product architectures) could lead to more context-sensitive insights into ambidexterity (Lavie et al. 2010). More work is needed on broader industrial trends where inter-industry boundaries are becoming ill-defined, a typical example of which is the Internet of Things (Porter and Heppelmann 2015). In such a setting, new relationships with unconventional suppliers might suddenly become a source of innovation, while relationships with existing long-standing suppliers might inhibit the elaboration of dynamic capabilities (Schreyögg and Sydow 2010). This suggests the importance of redefining the concept of boundaries to include "both closed and open contexts" (Benner and Tushman 2015, p. 498) when analyzing ambidexterity across multiple levels, including both intra- and inter-organizational relationships.

This also highlights another important limitation of this study, i.e. the exclusive focus on relationships with long-standing suppliers. In the future, we need to consider more self-supporting relationships with new suppliers from different industries. In fact, Toyota has recently paid greater attention to new technology areas, such as Integrated Safety Management and Intelligent Transport Systems (Toyota Motor Corporation 2014). This could imply a shift to more radical innovations and business models beyond the traditional confines of the automotive industry, for example collaborations with IT suppliers and public infrastructure providers. We need to carefully observe to what extent the model that we have laid out here can be compatible with these new innovation contexts. Another important avenue for future research is to develop

a framework that brings both the close and long-standing, as well as the heterogeneous and self-supporting buyer-supplier relationships to the fore, and analyzes how buying firms can strike a balance between incremental and radical innovation through the formation of multi-dimensional supplier relationships.

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Table 1 Average profit ratio and sales growth ratio in 2003-2014

	Toyota	Japanese carmakers (7 firms)	Western carmakers (7 firms)	Toyota suppliers (10 firms)	Japanese suppliers (10 firms)	Western suppliers (10 firms)
Profit ratio	4.6%	2.1%	2.5%	2.7%	2.5%	1.4%
Sales growth ratio	157%	147%	136%	198%	170%	134%

Japanese carmakers: Daihatsu, Fuji Heavy Industries, Honda, Mazda, Mitsubishi Motor, Nissan, Suzuki.

Western carmakers: BMW, Ford, General Motors, Mercedes-Benz Cars, PSA, Renault, Volkswagen.

Toyota suppliers: Aichi Steel, Aisin AW, Aisin Seiki, Denso, JTEKT, Koito Manufacturing, Tokai Rika, Toyoda Gosei, Toyota Boshoku, Toyota Industries (auto sector).

Japanese suppliers: CalsonicKansei, Jatoco, Kahin, KYB, NSK (auto sector), NTN, Sumitomo Electric Industries (auto sector), Takata, TS-Tech, Yazaki.

Western suppliers: Bosch (auto sector), Dana, Delphi, Faurecia, Johnson Controls (auto sector), Lear, Magna International Visteon, Valeo, ZF.

Table 2 Interviews and plant tours

	No. of interviews	Interviewees' roles	Interview locations	No. of plant tours
Toyota	38	CE, CP, HR, LG, PC, P, PD, PI, PU, Q, S	J, A, C, E, I	13
Supplier 1	43	CE, CP, HR, P, PD, PI, PT, PU,	J, A, C, E, I	15
Supplier 2	27	CE, CP, HR, P, PD, PT, PU, S	J, A, C, E	5
Supplier 3	17	CE, CP, HR, P, PC, PD, Q, S	A, C, E, I	4
Supplier 4	11	CE, CP, P, PT	J, C	3
Supplier 5	9	CE, P, PD, PI	E, I	2
Supplier 6	9	CE, HR, PI, PR, Q	J, C, E	2
Supplier 7	6	CE, P, PD	J, E	1
Supplier 8	4	CE, CP, PD, S	A	1
Supplier 9	3	CE, PD, S	E	
Supplier 10	3	CP	J	
Supplier 11	2	CE, P	E	
Supplier 12	2	CE	J	
Total	174			46

Abbreviation: CE: Corporate Executive, CP: Corporate Planning, HR: Human Resources, LG: Logistics, P: Production, PC: Production Control, PD: Product Development, PI: Process Improvement, PT: Production Technology, PU: Purchase, Q: Quality, S: Sales, J: Japan, A: America, C: China, E: Europe, I: India.

Note: We decided not to make clear what products suppliers mainly produce for Toyota in order to ensure anonymity.

Table 3-1 Key findings from the mass-production phase

Themes	First-order concepts	Representative quotes
Managing the control-autonomy trade-off		
Explicitness in goal setting for controlling supplier performance	Giving clear quality targets	“Quality measures include ppm, on-line defect rates, and quality audit performance. Every day we take 10 vehicles and do a real deep analysis of those vehicles for everything, shipping quality performance... So suppliers who have zero, zero, zero, zero are better performing quality suppliers” (PU, Toyota).
	Performance evaluation by KPIs	“We have a supplier evaluation system in the area of SQDC [safety, quality, development, cost]. Key performance indicators are set in each area. The quality target is less than (...) ppm. We evaluate whether a supplier achieved the KPIs or not” (PU, Toyota).
	Formulating price cut (<i>gentei</i>) requests	“Every six months Toyota negotiates a price with its 450 suppliers in Japan including <i>Kyohokai</i> [the name of Toyota’s supplier association] members... In the past few years it has demanded suppliers to lower prices by about 1% per year” (Nihon Keizai Shimbun [Nikkei Newspaper] 2014, p. 1)
	Difficulty for suppliers to meet <i>gentei</i> targets	“Part prices have been lowered in every project in the US. Besides that we receive <i>gentei</i> requests [from Toyota] once per year... Our basic strategy is to reduce labor and material costs without lowering quality. It is not easy to do in the US where it is difficult to find adequate materials” (P, Supplier 8).
Ambiguity in the implementation process for maintaining supplier autonomy	Stimulating suppliers to ask “why”-questions and explore root causes	“I ask suppliers where the problem is, when quality problems occur... Just creating a manual and adding a check-process is not enough as preventive measures. They need to pay attention to problem solving methods at a deeper level. They need to ask themselves: Why did the worker skip the checking? What is the real reason behind this?” (Q, Toyota).
	Teaching basics but let suppliers choose learning focus	“(...)san [a Toyota’s QC expert] comes to our plant to teach us some basics [on problem solving] for half a day... Toyota encourages us to create our own themes, and lets us do whatever we want, such as safety, quality, and cost reduction. There is no compulsion” (P, Supplier 2).
	Encouraging mutual learning among suppliers	“There is very little in the Toyota TEAM activity [a supplier development activity organized by its European supplier association] that is directly implemented by Toyota. There is much more emphasis on the suppliers themselves to learn from each other, to share best practices with each other, and particularly to develop some of the systems and ways of thinking from each other” (P, Supplier 4).
	Fostering suppliers' long-term perspective in <i>kaizen</i> implementation	“We started our QC circles after joining Toyota’s QC initiative [in the UK]. Cell leaders and group leaders on the shop-floor play a central role... We want to teach shop-floor operators how <i>kaizen</i> makes their jobs easier, and can make them happy... In doing so we attempt to gradually upgrade our capabilities” (CE, Supplier 2).
Organizational systems		
Structurally separated approach between different divisions	Mutual monitoring	“If purchasing staff requests part prices that are too low, engineering staff would raise an alarm. Toyota has a mutual monitoring system between purchasing, engineering, and production... If engineering staff confronts suppliers with technical requirements that are too high, purchasing staff raises an alarm” (CP, Supplier 1).
	Supplier support activity separated from <i>gentei</i>	“We have a joint project with Toyota to improve our surface finishing process. Toyota helps us to reduce costs in this process by jointly discussing how to make its marginal condition clear [for avoiding excessive costs for quality], which is helpful for us to reduce costs... In this project, Toyota says that it doesn't ask us to lower the part price as a result of this project” (CP, Supplier 10).
	Supplier support from a holistic perspective	“We provide aid not only to improve areas that produce parts for Toyota, but also to other areas that need to be improved. Our purpose is to raise the level of the company as a whole. Certainly, our main aim is to improve production lines that produce Toyota’s parts, but we recommend our suppliers to introduce the improved results to other production lines [for other customers] as well.” (Head of Supplier Support Center, Toyota).
Emerging category		
Requisite security	Negotiability of cost reduction targets (<i>gentei</i>)	“Toyota considers our production volume and material costs. Toyota understands the actual potential for cost reduction. [A Western customer] sometimes doesn’t care about the actual potential, they just ask us to reduce costs by 5%. Toyota always considers all factors in the negotiation process.” (CP, Supplier 1).
	Precise requirements but generous support	“Regarding Toyota I can say ‘precise requirements and generous support’. If we have a problem, Toyota always comes to our rescue in the end. This enables us to solve the same problem by ourselves next time, and establish a competitive position” (CE, Supplier 11).
	Listening to suppliers’ opinions	“One European carmaker ordered us to fix the part because it did not meet the development standard, even though it has never caused a problem... When we told Toyota; ‘this part has never caused a problem, even though it does not meet your standard’; Toyota amended its standard after they checked whether it was ok for them or not.” (Q, Supplier 4).

Table 3-2 Key findings from the product development phase

Themes	First-order concepts	Representative quotes
Managing the control-autonomy trade-off		
Ambiguity in goal setting for encouraging autonomous efforts	Going beyond explicit requirements	“We started with a small project with [new] suppliers. We teach them that it is insufficient to only meet our written criteria if they want to expand business with Toyota. However, Toyota will give them other information that is not in the written criteria” (PD, Toyota).
	Avoiding only a directive relationship with suppliers	“Some suppliers have excellent capabilities in terms of technology, quality and cost. We need a system that encourages suggestions from such suppliers. We don’t want to establish only a directive relationship with suppliers that would prevent us from getting good ideas from suppliers” (PU, Toyota).
	Suppliers' feedback for improving Toyota's design drawings Suppliers' efforts beyond explicit targets	“Japanese suppliers don’t just develop parts, regardless of the quality of design drawings given by carmakers. We actually make suggestions to Toyota on how the design drawings can be improved to meet Toyota’s quality standard” (CE, Supplier 3). “It sometimes happens that our part does not fit, even though the part lies within the design tolerance range. In this case our production division starts with fine-tuning between our part and Toyota's auto-body autonomously [instead of asking Toyota to change its design drawings and pay for additional costs]” (CE, Supplier 2).
Explicitness in the implementation process for controlled coordination	Standardization of the development process	“Toyota standardizes recurring elements in the development process in the Toyota Standard (TS) and the Design Standard (DS). The TS is an engineering standard that includes the design process, evaluation criteria, and materials used ... Suppliers need to follow the TS” (PD, Toyota).
	Transparent development processes	“Japanese carmakers do not only ask us to conduct this test and to submit that document at a certain point of time, but make the whole system including software and philosophy transparent to us. This is true for Toyota, Honda and Nissan” (CE, Supplier 4).
	Suppliers’ internal functional coordination	“When problems occur on the shop-floor which are caused not only by manufacturing but also design issues, our president sends design engineers to the plant floor and asks them to stay there until the problem is solved... Engineers need to better reflect manufacturing issues into the design drawings if they want to avoid that” (CE, Supplier 7).
Organizational systems		
Structurally integrated approach	Cross-functional problem solving with suppliers (<i>obeya</i>)	“Toyota always stresses the importance of joint efforts among sales, production, engineering, and suppliers. We believe that we cannot develop a good car without these efforts... If there are any problems, people from engineering, quality, purchasing, suppliers, product development, sales get together in a room, and make a joint decision. We call this <i>obeya</i> [big room] activity” (CE, Toyota).
	Aligned PD system between Toyota and suppliers	“Our job differs from just creating design drawings for Toyota. We plan which product would be good for Toyota, create a proposal, and actually develop the product... We have the same development system as Toyota... We have SE [simultaneous engineering] activities where our suppliers and <i>gemba</i> [manufacturing] people [from this supplier] come together, and incorporate <i>gemba</i> outcomes into design drawings” (PD, Supplier 3).
	Information sharing with suppliers	“The information we want to obtain from the customer is the performance results for the whole system that our part goes into... We have only developed a relationship that share such information with Toyota. After jointly developing a system part with Toyota, we are allowed to sell this part to other makers” (S, Supplier 2).
Emerging category		
Requisite security	Giving suppliers opportunities to use their investments for upcoming models	“Our Japanese suppliers understand <i>keiretsu</i> [the value of longstanding relationships]. They make great efforts for the current model project, which will be considered for upcoming models [even though they are not successful in the current model]” (PD, Toyota).
	Allowing suppliers to continue working on targets for future models	“[Regarding CCC21’s 30% cost reduction], Toyota allowed us to achieve the target until the launch of the next car model, and adopted our part even though that part had not met the target at that time” (CE, Supplier 3).
	Providing advice to suppliers for upcoming models	“Toyota’s purchasing sometimes takes our side when we face difficulty [to earn the trust of other divisions in Toyota]. They advise us on how to persuade Toyota’s design to adopt our parts, and which point should be improved first and so on” (Q, Supplier 4).
	Making suppliers feel secure to invest in a long-term relationship with Toyota	“Since we feel secure in doing business with Toyota over a long period, we can allocate many of our resources for Toyota, dedicate a lot of our engineers to Toyota. Of course, we don't have a solid guarantee that Toyota will purchase our parts in the future, but we feel secure in doing business with Toyota” (CP, Supplier 1).

Figure1 Emerging theory on ambidexterity in buyer-supplier relationships

